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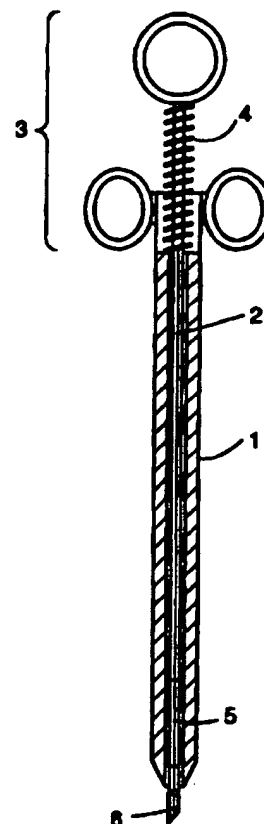
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(54) Title: ENDOSCOPIC SUTURE PLACEMENT TOOL

(57) Abstract

This invention is a surgical tool for endoscopic suture placement which permits a surgeon to place controlled and precise internal ligatures. The tool utilizes a drive rod (2) including an articulating or deflecting portion (5). When forced to an extended position, the deflecting or articulating portion forms a hook or J-shaped needle, the tip of which can be used to accurately position the suture.



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ENDOSCOPIC SUTURE PLACEMENT TOOL

FIELD OF THE INVENTION

This invention relates to medical devices used to place controlled and precise internal ligatures.

5 The device is particularly useful for endoscopic suture placement.

BACKGROUND OF THE INVENTION

During endoscopic surgery, precise placement of ligatures is required. Commonly, during endoscopic
10 and other surgeries, sutures are placed using any number of devices. However, such devices require extreme dexterity and care on the part of the surgeon in order to reach the necessary position without dropping the suture. Thus, it would be desirable to
15 identify a device which would permit a surgeon to precisely place internal ligatures in a controlled manner.

SUMMARY OF THE INVENTION

Accordingly, the present invention is a ligature
20 device including an outer sheath having a distal end, a drive rod slidably mounted to said outer sheath for movement between a retracted position and an extended position, the drive rod including a deflecting portion having means for holding a ligature, the
25 deflecting portion being at least partially confined within the outer sheath and having a first shape when the drive rod is in the retracted position, the deflecting portion extending from the distal end of the outer sheath and having a second shape when the
30 drive rod is in the extended position, the first and second shapes being different, and a movable actuator

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attached to the drive rod for moving the drive rod between the retracted and extended positions.

5 In one form of the invention, the ligature holding means includes a passage extending inwardly from an outer surface of the deflecting portion, the transverse passage terminating at an eyelet.

In another form of the invention, the deflecting portion is made of a shape memory alloy.

10 In yet another form of the invention the device includes means for biasing the drive rod toward the retracted position. Such biasing means can be a coil spring.

15 In a preferred form of the invention the first shape of the deflecting portion is substantially linear and the second shape is curved to form a hook or J-shape.

In order to promote stability, the outer sheath may include a hollow interior having a square cross-sectional shape.

20 In another form of the invention, the deflecting portion is completely housed within the outer sheath when the drive rod is in the retracted position.

BRIEF DESCRIPTION OF THE DRAWINGS

25 The invention will be better understood by reference to the appended drawings of which:

Fig. 1 is cross-sectional side view of a preferred embodiment of the invention in its relaxed or rod retracted position;

30 Fig. 2 is an enlarged cross-sectional side view of the distal end of the device showing the position of the suture tip when the device is in a rod retracted position; and

Fig. 3 is an enlarged cross-sectional side view of the distal end of the device showing the position

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of the suture tip when the device is in a rod extended position.

DETAILED DESCRIPTION OF THE INVENTION

5 The apparatus of the invention is shown in detail in Figs. 1-3.

Referring to Fig. 1, the endoscopic suture placement device of the invention is shown in a side, cross-sectional view. As can be seen, the device is made up of an outer sheath or housing 1, which is an extended, tubular-shaped sheath on or in which the other components of the device are mounted. In the preferred embodiment shown, the length of the outer housing will be approximately 450 mm, and will include a passage into which drive rod 2 is positioned. Housing 1 can be made of any structurally adequate material which can be medically approved such as plastics, metals, composites, ceramics, and the like, as are well known in the art. For structural purposes, and to ensure that drive rod 2 does not twist when in use, it is preferred that the cross-section of the passage in which the drive rod 2 is positioned is square or diamond shaped. Likewise, the cross-section of drive rod 2 will match that of the passage through the housing. Generally, the length of a side of the diamond-shaped cross-section of drive rod 2 will be from about 1-2 mm. The passage will, of course, be slightly larger to accommodate movement of the drive rod.

30 Movement of drive rod 2 from the rod retracted position shown in Figures 1 and 2 is accomplished using hand actuator 3, which, as seen in Figure 1, consists of three finger/thumb rings, though many different handle/actuator configurations are possible. In use, the surgeon will grasp the device

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using finger/thumb rings in the same manner as holding a syringe. A spring 4 is mounted surrounding a proximal portion of drive rod 2 and supported within housing 1 to bias the rod to a retracted position.

5 The fourth key component of the invention is a deflecting portion 5 of drive rod 2 positioned at the distal end of drive rod 2 and between drive rod 2 and a suture tip 6.

10 Deflecting portion 5 is preferably formed from a filament of shape memory alloy (SMA), such as Ni/Ti alloy. SMA of the type useful in the present invention is available from Shape Memory Applications, Inc. of Sunnyvale, California, under
15 the name NiTi Super Elastic Wire Cr-Dp. It should be recognized, however, that many other materials can be used, so long as they meet the performance requirements for the deflecting portion, i.e. that
20 they will form an "arc" when extended from the housing by motion of the actuator, so that the surgeon gains the advantage of being able to place the suture underneath the tissue by pulling the device back toward him or her.

25 Labels in Figure 2 indicate the same components as in Figure 1. Also, as in all views, components are shown as spaced from one another for clarity and are not to scale. As can be seen, suture eyelet 7 is shown in Figure 2.

30 Fig. 3 shows an enlarged cross-sectional view of the distal portion of the device when drive rod 2 is in its extended position. In this position, deflecting portion 5 returns to its "memorized" curved or hooked configuration, thereby forming a J-shaped hook at the distal end of the device.

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In use, the surgeon will first position a suture in suture tip 6, secured in suture eyelet 7, then position the tip at the desired position in the patient's body, force the tip to the extended J-shaped configuration, which forces the suture tip and suture through the desired tissue. Suture placed laparoscopically requires the ability to penetrate multiple tissue planes with precise control. The device of the invention provides this action through the use of the described embodiments.

The invention can be used for many different kinds of procedures including, but not limited to, laparoscopic hysterectomy, laparoscopic Birtch and laparoscopic Nissan procedures.

Although only the most preferred embodiment of the invention has been shown and described. Many modifications and rearrangements of the components of the invention, which nevertheless include the key features thereof, will be apparent to those skilled in the art. Thus, such modifications are considered to be within the scope of the appended claims.

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WHAT IS CLAIMED:

1. A surgical tool including:

(1) a tubular, elongated housing having a proximal end, a distal end, and a passage defining a rod axis therethrough;

(2) a suture tip;

(3) a suture tip drive rod positioned within said passage, and moveable along the length thereof from a drive rod retracted position to a drive rod extended position;

(4) biasing means for forcing said drive rod to said retracted position;

(5) handle means for positioning said drive rod within said housing and forcing said rod from said retracted to said extended position;

(6) deflecting means secured on a first end to a distal portion of said drive rod and on a second end to said suture tip for deflecting said suture tip from said axis when said rod is in said extended position.

2. A ligature device including:

an outer sheath having a distal end;

a drive rod slidably mounted to said outer sheath for movement between a retracted position and an extended position, the drive rod including a deflecting portion having means for holding a ligature, the deflecting portion being at least partially confined within the outer sheath and having a first shape when the drive rod is in the retracted position, the deflecting portion extending from the distal end of the outer sheath and having a second shape when the drive rod is in the extended position, the first and second shapes being different; and

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a movable actuator attached to the drive rod for moving the drive rod between the retracted and extended positions.

5 3. A ligature device according to claim 2, wherein:

the ligature holding means includes a passage extending inwardly from an outer surface of the deflecting portion, the transverse passage terminating at an eyelet.

10 4. A ligature device according to claim 2 wherein:

said deflecting portion is made of a shape memory alloy.

15 5. A ligature device according to claim 2 further comprising:

means for biasing said drive rod toward the retracted position.

20 6. A ligature device according to claim 5 wherein:

said biasing means comprises a spring.

7. A ligature device according to claim 2 wherein:

25 the first shape of the deflecting portion is substantially linear and the second shape is curved to form a hook shape.

8. A ligature device according to claim 2, wherein:

30 the outer sheath includes a hollow interior having a square cross-sectional shape; and

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the drive rod is at least partially housed within the hollow interior of the outer sheath.

9. A ligature device according to claim 2, wherein:

5 the deflecting portion is completely housed within the outer sheath when the drive rod is in the retracted position.

10. A ligature device including:

10 an outer sheath having a distal end, a hollow interior, and a proximal end having first and second finger engagements;

15 a drive rod slidably mounted to said outer sheath for movement between a retracted position and an extended position, the drive rod having distal and proximal ends and being at least partially housed within the hollow interior, the drive rod including a deflecting portion having means for holding a ligature, the deflecting portion being at least partially confined within the outer sheath and having
20 a first shape when the drive rod is in the retracted position, the deflecting portion extending from the distal end of the outer sheath and having a second shape when the drive rod is in the extended position, the first and second shapes of the deflecting being
25 different; and

 a movable actuator attached to the drive rod at the distal end for moving the drive rod between the retracted and extended positions, the movable actuator including an actuator engagement
30 mounted to the proximal end of the drive rod.

11. A ligature device according to claim 10, further comprising:

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a spring mounted between a portion of the outer sheath and a portion of the movable actuator, the spring biasing the movable actuator toward the retracted position.

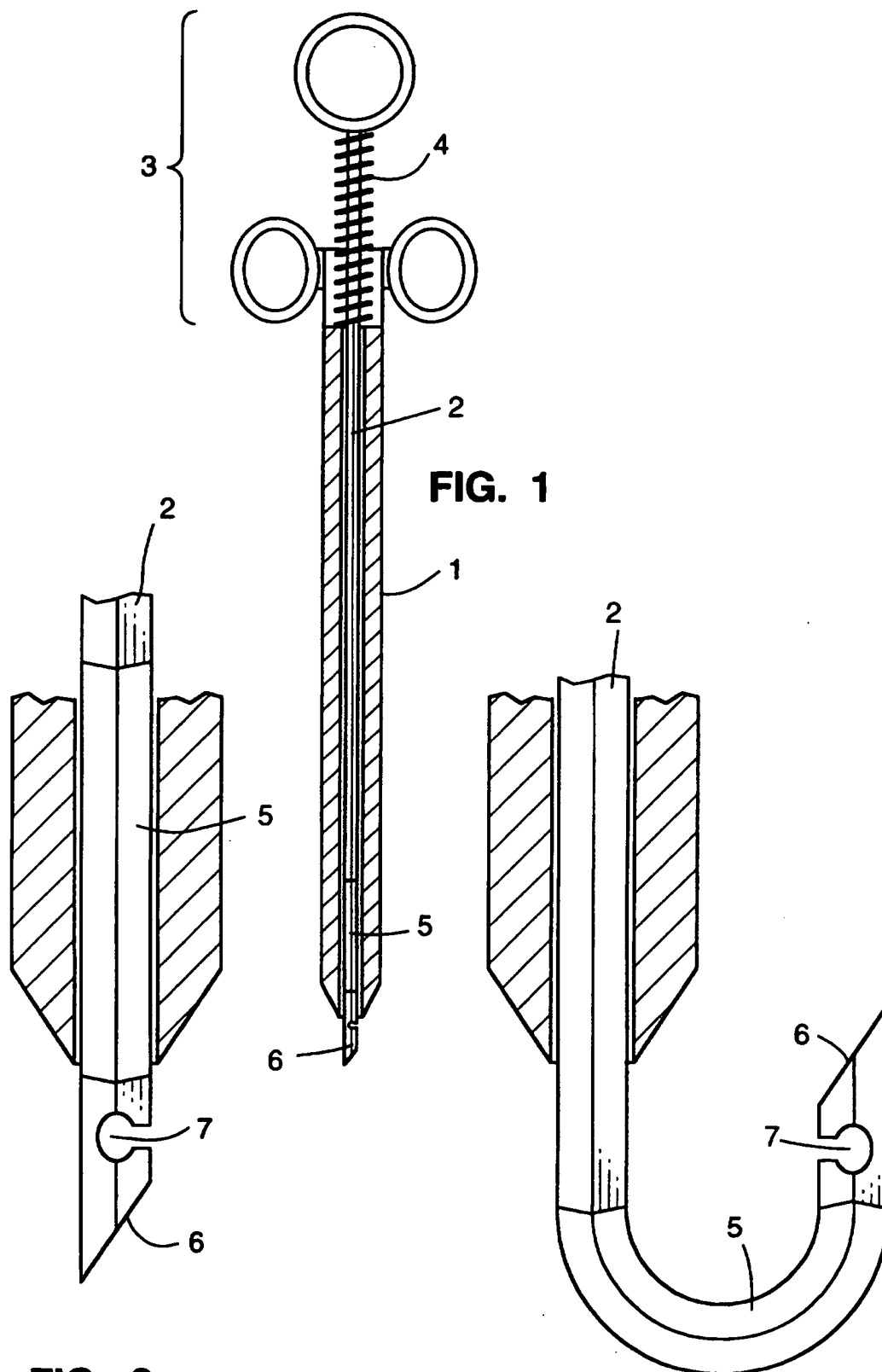


FIG. 2

FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US95/10495

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :A61B 17/00

US CL :606/148

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 112/80.03, 169; 606/139, 144-148, 151

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US, A, 5,250,054 (LI) 05 October 1993, See Figs. 1-6 and 7d.	2-4, 7, 10 ----- 1, 5, 6, 11
Y	SU, A, 969,254 (KAUN MED INST) 30 October 1982, see Abstract.	1, 5, 6, 11

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of mailing of the international search report

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